REMARKS/ARGUMENTS

Upon entry of this reply, claims 19-45 will remain pending. Claims 19 and 29 are independent claims.

Reconsideration and allowance of the application are respectfully requested.

U.S. Patent No. 4,971,696 to Abe et al. Is Not Listed On Form PTO-892

Applicants note that the Examiner has not listed the new-ly cited Abe et al. on a Form PTO-892. Therefore, Applicants are submitting a Form PTO-1449 citing this document. The Examiner is therefore respectfully requested to initial the form, and forward an initialed copy of the form with the next communication from the Patent and Trademark Office.

Response To Maintaining Of Restriction Requirement

Applicants once again note that the requirement previously confirmed that rejoinder of the non-elected process claims is possible upon allowance of product claims, and if the process claims contain all the limitations or are dependent on the product claims. Therefore, Applicants respectfully request that the Examiner review the process claims, and rejoin them upon allowance of the elected product claims. Moreover, for the reasons set forth below, Applicants respectfully submit that their invention is patentable over the prior art of record, whereby allowance of all of the pending claims is warranted, and respectfully requested.

Response To Rejections Based Upon Prior Art

Response To Rejections Based Upon Ravagni et at.

(a) Claims 19-23, 25-28, 42 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. 103(a) as obvious over WO 96/30207 A1 to Ravagni et al. (U.S. Patent No. 6,576,182 being used as the English language equivalent of the cited International Publication).

(b) Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO 96/30207 A1 to Ravagni et al. in view of Partlow et al., U.S. Patent No. 5,683,528.

Initially, Applicants once again note that U.S. Patent No. 6,576,182 is a family member of WO 96/30207, and is in the English language. Accordingly, in discussing WO 96/30207, reference will specifically be made to its family member U.S. patent, and these family member documents will collectively be referred to as "the Ravagni documents".

Moreover, Applicants note that arguments for patentability of Applicants' disclosed and claimed invention are set forth in their previous responses. For the sake of brevity, Applicants are not repeating each of these arguments herein, but include Applicants' previous arguments herein as if set forth in their entirety herein.

Applicants respectfully submit that the rejection is clearly without appropriate basis when, in fact, the Examiner admits at the bottom of page 7 that the structure of the Ravagni document is different than that recited by Applicants. In particular, the Examiner notes that Applicants' argument that the Ravagni documents show considerable change in the particle size, morphology, composition and/or crystal structure may be true, but contends that these changes occur during the manufacture.

Following this admitted difference in the structure, the Examiner contends that this does not affect patentability as long as the product anticipates. However, in contrast to the Examiner's assertion, a product cannot be anticipated when the structure is different even if the different structure may be attributable to its method of production.

The Examiner is reminded, as noted in MPEP 2113, that the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g., *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of construction as structural limitations.)

Accordingly, for at least the reasons noted above, the rejections are without appropriate basis and should be withdrawn.

Moreover, the Office Action asserts that the limitation that the ceramic particles are bound by spot or surface connections by the wetting material is taught by Ravagni in that Ravagni teaches low-temperature-sintering glass for adjusting shrinkage as "widely used" in col 1 lines 23-45, but not good for many applications. The Office Action contends that this teaching of Ravagni anticipates the limitation.

However, in contrast to the assertions in the Office Action, one limitation does not an anticipation make. The rejection must establish that the product as recited in Applicants' claims, and not merely one alleged element is within the four corners of the document . In this regard, as

apparently admitted by the Examiner, Ravagni does not sufficiently envision structure as recited in Applicants' claims. Any extent of use of a certain material in the prior art is immaterial when Ravagni specifically teaches against such use, and does not show any such use in his invention. The Patent and Trademark Office has the burden of establishing anticipation.

In contrast to complying with the burden of establishing anticipation, the rejection merely asserted that teaching away is anticipatory, and alleges that other documents teach glass binder as being widely used. However, the present situation is different from that asserted in the rejection. The Ravagni documents do not disclose Applicants' invention, and then teach away. Instead, the Ravagni documents teach against using a certain material.

Thus, the question is not what is in other documents, but what the Ravagni documents disclose. If the Examiner deems that other documents disclose Applicants' invention, then a rejection should be made with the other documents. The Examiner is apparently looking at isolated disclosure and not the combination of features recited in Applicants' claims.

If this ground of rejection is maintained, the Examiner is respectfully requested to indicate how, "Ravagni's teaching away from the glass binder for certain applications anticipates the claims." In this regard, the Examiner is respectfully requested to establish where the combination of features recited in Applicants' claims is taught by "Ravagni's teaching away".

Applicants claims must be taken as a whole, and the rejection must establish that each and every element of Applicants' claims, i.e., the combination of elements recited in Applicants' claims must be envisaged in Ravagni.

In the instant situation, the rejection is merely looking at one portion of Ravagni and <u>not</u> indicating how this disclosure is combined with other portions of Ravagni. Thus, the rejection is

relying upon the Description of the Background portion of Ravagni for the following disclosure:

> Among the most widely employed techniques is the use of low-temperature-sintering glass phases by means of which, in combination with appropriate starting powders, sintering temperature and shrinkage on sintering are adjusted.

Applicants respectfully submit that such disclosure does not anticipate Applicants' claims, which include more structure than a wetting material. The background disclosure of Ravagni cannot be combined with the inventive concepts of Ravagni which seeks to avoid the use of glass. For example, the Examiner is reminded that the next portions of the Description of the Background of Ravagni, beginning at column 1, line 43, disclose the following:

> However, for many applications glass phases cannot be used since they adversely affect the material properties of one or more components or the required properties are not achieved at all in the system. In these cases, attempts are made to realize the different material pairings by means of the grain size dependence of the sinter activity of powders. This method of matching the shrinkage on sintering can be employed for many material combinations, but it is associated with considerable technical complication and financial cost. In complicated processes, the grain size distributions of the components have to be matched to one another or powders of appropriate fineness have to be produced first. All techniques have in common the fact that not only selected raw materials but also organic additives are required. These additives, on the one hand, are to disperse the powders homogeneously and in a deagglomerated state in a dispersion medium. On the other hand, they assume the function of processing aids by means of which the rheological properties or the processability of the ceramic compositions are matched to the requirements of the respective shaping process. Depending on the shaping process, the proportion of organics can be up to 50% by volume and has to be removed before sintering, sometimes by complicated and time-consuming processes. This step becomes particularly difficult when different materials such as ceramic/metal are joined to form one part, since the removal of the organic processing aids then has to be additionally carried out under inert conditions. In order to overcome these difficulties and limitations, it would be extremely worthwhile to develop techniques, processes or materials which permit very substantial matching of the shrinkages on sintering when using unlike materials and at the same time make do without addition of organic processing aids or make do with greatly reduced proportions of these. In the ideal case, the function of the organic processing aids

> should be taken over by inorganic materials which are converted into the ceramic material during sintering. (Emphasis added.)

The Examiner is reminded that in order for anticipation to be present, each and every element recited in Applicants' claims must be shown in the prior art document, and the prior art document must show that the combination on elements is sufficiently envisaged. In other words, Ravagni must show the identical invention recited in Applicants' claims in complete detail. The rejection cannot merely take isolated portions of a document, and point to one feature of Applicants' claimed invention to establish either anticipation or obviousness.

As previously noted by Applicants, Ravagni is contrasting his invention from the prior art. While Ravagni discloses further components including glass, there apparently is no disclosure of glass as a wetting material. As previously noted by Applicants, the specific characteristic of the powders i-iv in the first layer of the Ravagni documents is that they are made of ceramic and either differ in grain size or have a sinter-inhibiting effect. Because of this, particles are present in the sintered material either loosely or are fused together, but without being wetted by a second phase. This is unlike the present invention, and cannot yield structure as recited in Applicants' claims. Thus, Applicants respectfully request that the rejection specifically indicate how the structure recited in Applicants' claims is taught or suggested in the Ravagni documents when it would be readily apparent to one having ordinary skill in the art that the structures are different.

If this ground of rejection is maintained, the Examiner is respectfully requested to specifically point out how the combination of features recited in Applicants' claims is anticipated by the Ravagni documents. In this regard, it is respectfully requested that the rejection point to each feature recited in Applicants' claims, and indicate how a product

having these features is present in the Ravagni documents. This application of the prior art to the claimed invention must include more that mere reference of isolated disclosure in the Ravagni documents, especially when the isolated disclosure is taught not to be part of Ravagni's invention.

Emphasizing the above, as Applicants have previously argued, according to the present invention the recited structure includes the feature that the particle size, particle morphology and particle composition/crystal structure of the ceramic particles is not altered or only slightly altered with about $\leq$ 1% shrinkage of the ceramic multi-layer filter, and in which at least one of spot and surface connections are formed between the particles by said at least one material; and pore volume and pore size between the ceramic particles is reduced by the material only slightly or only partially but not by more than 50%. In contrast, in the Ravagni documents a considerable change of the particle size and/or particle morphology and/or particle composition and/or crystal structure occurs, and the amount of pores and the pore size of the shrinkage-matched component in the Ravagni documents are thus also changed considerably. This change is expected in the Ravagni documents by one skilled in the art, because the particles change their form and size through the participation of the ceramic component in the sintering.

This does not occur in the present invention because no sinter bridges are formed between the ceramic particles during sintering and so no change in the ceramic particles takes place. The bond between the ceramic particles substantially occurs through the bonds formed through the liquid phase of the wetting material. **This is a difference in structure and must be addressed in the rejection.**

Still further, Applicants' claims include that the particle surfaces of all ceramic particles in each of said at least two layers, during formation of said at least two layers, are wet entirely or partially with at least one material which wets the surfaces of the ceramic particles and has the same or approximately the same thermal coefficient of expansion as the ceramic particles. Thus, the at least one material wets the surface of the ceramic particles, and has the same or approximately the same thermal coefficient of expansion as the ceramic particles. Moreover, the at least one material does not alter or only slightly alters the particle size, particle morphology and particle composition/crystal structure of the ceramic particles with about $\leq 1\%$ shrinkage of the ceramic multi-layer filter, and in which at least one of spot and surface connections are formed between the particles by said at least one material. The Ravagni documents do not disclose such a material and do not teach or suggest a ceramic multi-layer filter having a structure as recited in Applicants' claims.

To further emphasize the differences between Applicants' claimed invention and the subject matter disclosed by the Ravagni documents, Applicants once again submit the following information regarding the Ravagni documents and the presently claimed invention.

Product Disclosed In Ravagni Documents

composite including

at least two components (A+B)
- at least one ceramic component (**A**) which is **adjusted to shrinkage behaviour of B** (column 2, beginning at line 15)
- component(s): ceramic or non-ceramic (**B**) with a given shrinkage behaviour

component A: is produced

- **by sintering** of **ceramic** powders (column 2, beginning at line 29)

(sintering means per definition: temperature treatment below melting point, typically 0.7 of melting point)

- **by using one of three types of powders** (column 2, beginning at line 37)

a) powder (i) $\leq$ 500 nm
b) powder (i) + powder (ii) $\leq$ (i), with sinter-inhibiting properties
c) powder (i) + powder (iii) $\geq$ (i) and $\leq$ 500 μm

Sintering which is a temperature treatment below melting point means **in all three cases a/b/c** that powder particles are **sintered together without any melting phase** between particles.

The sintered product (ceramic component A) of the composite contains bonded ceramic particles, fully or partially sintered together but **without any secondary phases between** the **ceramic** particles – no other materials than ceramics, such as **no metals, no glasses**.

To get a bonding between the particles without a secondary phase means that **powder particles have to alter their shape and/or size (morphology)** to form sintered necks during the temperature treatment. Otherwise the powder will not be bonded together.

In the Ravagni documents, each of the three cases a)-c) a **"nano"sized powder (i) $\leq$ 500 nm must be involved** (column 2, beginning at line 29). Otherwise the process of shrinkage adjustment does not work.

component(s) B: is made of - ceramic or non-ceramic, ceramic, metal, glass (column 3, beginning at line 48), not specially described,
- **special case of B**: - B is made of powder (iv), which is made of agglomerates of powder (i). (column
In such case, B is made only from ceramics, because powder (i) is per definition a ceramic.

In the Present Invention:

composite

Multilayers, at least two layers (A+B)
- **(A)** made of ceramics, built by ceramic particles
- **(B)** also made of ceramics, built by ceramic particles, which are different in size from (A)

In both cases (A+B), the **surface of the particles is wetted by a secondary material** (such as glass).

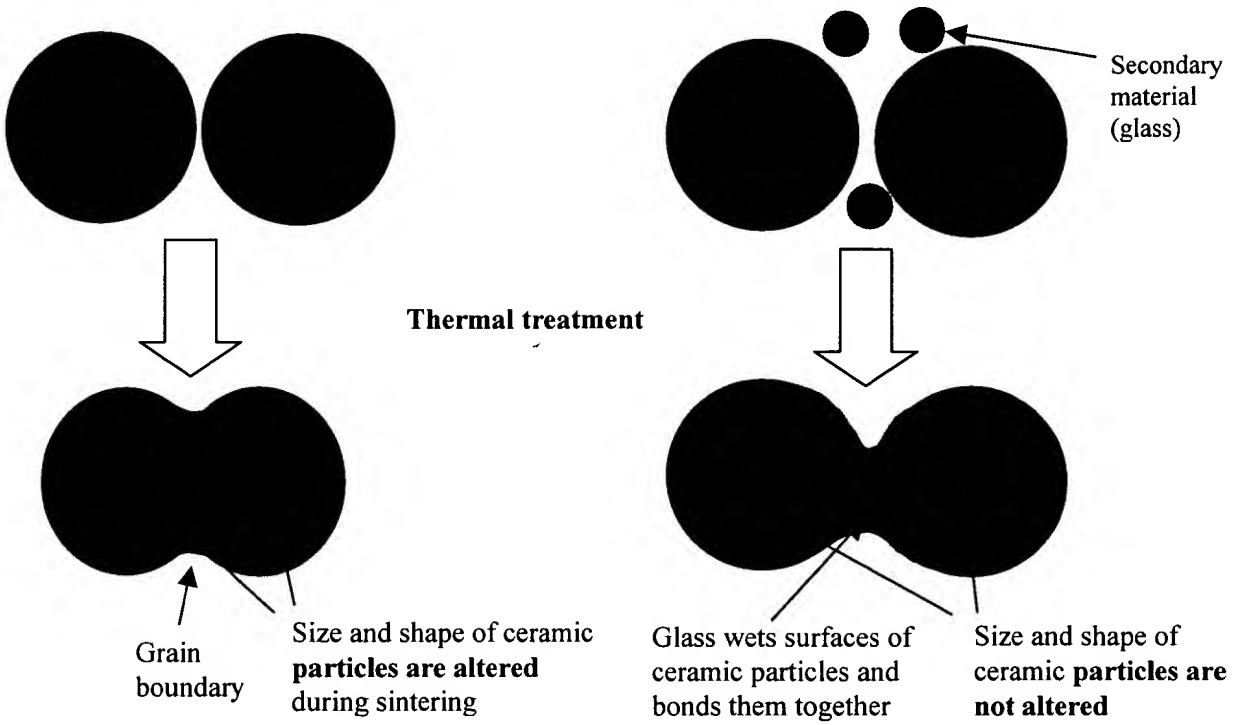
That means:
- (A) is made of ceramic particles, bonded by the secondary material
- (B) is made of ceramic particles (with different size), also bonded by the same secondary material

The **connection** between the particles **in both layers (A+B)** is made by the **secondary material, not by the ceramic.** The ceramic particles (size, morphology, composition) are **not** altered.

This means contrary to the Ravagni documents that no sintering between the ceramic particles takes place, but a melting of the secondary material (Temperature above Tm of the secondary material).

Ravagni Documents
Starting powders and materials structure in **component A** of composite

Instant Application
Starting powders and materials structure in **both** components



Thus, Applicants once again note that their arguments are not only directed to process conditions, but to differences in structure associated with Applicants' ceramic multi-layer filter, and these structural differences are not taught nor suggested in the prior art of record. Thus, Applicants have addressed differences in structure, and the rejection must address these differences in structure.

Further expanding on the Examiner's assertion that, according to Ravagni, "low-temperature-sintering glass" is commonly used to adjust shrinkage, Applicants note that this is not good for many applications. The concept of sintering, however, is exactly where the conventional approach differs from the approach according to the invention. According to the present invention, the material wets the particles and forms the "spot and surface connections," i.e., it fuses on, wets and the "connections" are then composed *exclusively* of this material. The particles, however, remain unchanged and thus do *not* participate in the connection. By contrast, sintering with sintering additives according to the prior art, e.g., with "low-temperature-sintering glass," achieves a reaction with the particles, and in particular the formation according to the invention of the connection between the particles does not occur.

Furthermore, Ravagni does not teach or suggest particle surfaces of all ceramic particles in each of the at least two layers. In the adjustment of the shrinkage behavior of a layer to another layer, the additive would typically be used only in the layer to be adjusted.

Moreover, Applicants stress that the statement that the further description in claim 19 "wet by wetting material" is a description of the processes during production and not a product description is contradicted by the fact that the wetting is a state that prevails even after sintering in Applicants' product.

Still further, the Examiner's attention is once again directed to the Examples of Ravagni which include embodiments which show a different structure than that recited by Applicants.

Example 1 of the Ravagni documents is directed to a composite of a dense ZrO_2 layer (sheet B) on a porous ZrO_2 substrate (sheet A). This should not be considered to be a multi-layer filter, because of the dense layer. Moreover, before sintering sheets A and B contain ZrO_2 particles of 10 nm. During sintering at 1150°C for 2h both sheets are subjected to a linear shrinkage of 40% and one of the sheets is densely sintered. Moreover, such high shrinkage should lead to a considerable change of the 10 nm particles and it will be possible to detect changes in form and size of the particles in the structure.

A two-layer structure is described in Examples 3 – 5, the sheets in these examples are sintered together at 1500°C for 2h, and it is disclosed that there is a linear shrinkage of 5% (sheet A) and 4% (sheet B). The differences between 5 and 4% are considerable for sintering a layer composite and would lead to stresses or distortion of the laminate. With a length of foil of 100 mm, this would be a1mm difference in length. It does not appear that a shrinkage of 4-5% is sufficient to achieve dense layers whereby the two layers may be porous. However, at a sinter temperature of 1500°C, at least the fine corundum powder (200 or 400 nm) will be greatly changed in both layers with regard to form and size, since otherwise no sintering of the particles would occur and after sintering the material would disintegrate into its powder components. One skilled in the art would also expect powders of this fineness to be considerably changed regarding size and grain form during sintering at the given temperatures.

In Example 6, sintering is performed at 1550°C and leads to a shrinkage of 30% and to a dense layer B, so that here an analogous great change of the grain size, the pore size and the pore

volume as in Examples 1-2 is to be assumed. Also, a change in crystal structure would be expected under these sintering conditions with the gamma Al_2O_3 being transformed into the alpha phase.

Still further, the Examiner is once again reminded that in order for inherency to be present the Examiner has the burden of showing that the result indicated by the Examiner is the necessary result, and not merely a possible result. In the instant situation, as previously noted by Applicants and as again noted herein, **it is seen that the Ravagni documents do not teach the ceramic multi-layer structure recited in Applicants' claims, and the prior art does not teach or suggest any modification of the Ravagni documents to arrive at Applicants' disclosed and claimed invention, and the advantages associated therewith**. Thus, Applicants are establishing that inherency is improper in the instant rejection for establishing that Applicants' product is inherently in the prior art.

Applicants once again note that Partlow does not overcome the deficiencies of the Ravagni documents. In this regard, Partlow is utilized in the rejection merely for its disclosure of borosilicate glass in ceramic layers. Accordingly, whether or not Partlow would motivate one having ordinary skill in the art to include borosilicate glass in the Ravagni documents, Applicants' disclosed and claimed invention would not be present.

Still further, Applicants' dependent claims further patentably define Applicants' inventions. Thus, claim 20 further patentably defines that when more than two layers are present on the support layer, the particle size of the ceramic particles decreases in a direction going away from the support.

Claim 21 further patentably defines that the at least two layers comprise layers of the same ceramic material.

Claim 22 further patentably defines that the ceramic material is silicon carbide or aluminum oxide.

Claim 23 further patentably defines that the ceramic material in all layers of the filter and the material which wets the surfaces of the ceramic particles, have a same composition in all layers of the filter.

Claim 24 further patentably defines that the material that wets the surfaces of the ceramic particles and forms the at least one of spot and surface connection between the ceramic particles is a borosilicate glass, an aluminum borosilicate glass or a lithium aluminum silicate glass. As discussed above, the Ravagni documents do not teach or suggest such a glass material.

Claim 25 further patentably defines that the quantity of material, which wets the surface of the ceramic particles and forms the at least one spot and surface connection between the ceramic particles, is selected in terms of size in such a way that the pore volume and the pore size between the particles is reduced only slightly by the material.

Claim 26 further patentably defines that the quantity of material, which wets the surface of the ceramic particles and forms the at least one spot and surface connection between the ceramic particles, is selected in terms of size in such a way that the pore volume and the pore size between the particles is reduced by not more than 10%.

Claim 27 further patentably defines that the ceramic particles of at least two layers differentiate from one another in a ratio of 1 : 5 to 1 : 10 in terms of their average particle size.

Claim 28 further patentably defines that the particles of the support layer have an average particle size of 20 to 50 μm.

In view of the above and the arguments previously set forth by Applicants which are incorporated herein, the rejections of record should be withdrawn, and all of the pending claims indicated to be allowable. In the event that the rejection is maintained, the Examiner is respectfully requested to specifically point out structural similarities between Applicants' disclosed and claimed invention with respect to the prior art when the prior art is different from Applicants' invention in the diverse instances noted above.

Response To Rejections Based Upon Abe et al.

(a) Claims 19-27, 42 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. 103(a) as unpatentable over Abe et al. (hereinafter "Abe"), U.S. Patent No. 4,971,696.

(b) Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Abe, U.S. Patent No. 4,971,696.

Applicants note that the rejections improperly point to different pore sizes in trying to arrive at the different particle size feature of Applicants' claims. Therefore, if this aspect of the rejection is maintained the Examiner is respectfully requested to point to appropriate disclosure in Abe in combination with other features of Applicants' claims to establish anticipation.

Moreover, the rejection refers to Abe, column 4, lines 42-55 for forming the filter with sintering ceramic particles and borosilicate glass. However, the borosilicate glass of Abe is used only as a support and would therefore not form spot or surface connections between the particles as recited in Applicants' claims. Accordingly, this structural feature of Applicants' claims is not taught or suggested in Abe.

Moreover, Applicants note that Abe describes the adjustment of the pore sizes of the support or of intermediate layers ("monolayer or multilayer porous support") to the filter layer applied last ("porous thin layer") in order to prevent the formation of imperfections ("pinholes") and cracks. Ceramics, glass or metal are described as materials for the support and examples of these material groups are given (column 4, lines 45 through 50). However, Abe does not describe, as stated in the rejection, that the support is formed of ceramic particles *and* borosilicate glass! Furthermore, the simultaneous use of just any ceramic powder and any borosilicate glass powder would not automatically result in the wetting and connection according to the invention, as stated in the rejection. In column 5, lines 30 through 35, it is *not* described that the materials *within* one layer should have the same expansion coefficient, but only the materials of the various layers.

Regarding the obviousness rejection of claim 28, Applicants respectfully submit that this ground of rejection is not supported by any disclosure in the prior art, comprises a naked assertion, and should therefore be withdrawn. Moreover, the asserted obviousness is not clear, because it merely alleges that the support layer average particles size could be determined to suit the pore size, but does not indicate how such a determination could be made by one having ordinary skill in the art.

Abe does not teach or suggest the structure recited in Applicants' claims, and this ground of rejection should be withdrawn.

CONCLUSION

In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections of record, and allow each of the pending claims.

Applicants therefore respectfully request that an early indication of allowance of the application be indicated by the mailing of the Notices of Allowance and Allowability. As noted during a May 4, 2005 telephone call to the Examiner, if the Examiner is not convinced of patentability of the claimed subject matter upon review of the application, the Examiner is requested to contact the undersigned to discussed the application.

Should the Examiner have any questions regarding this application, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,
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FORM PTO-1449 U.S. Department of Commerce Patent and Trademark Office	Atty. Docket No. P21094	Application No. 09/856,495
INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Use several sheets if necessary)	Applicant Jörg ADLER et al.	
	Filing Date I.A. Filed December 3, 1999	Group 1723

U.S. PATENT DOCUMENTS

EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
		4 9 7 1 6 9 1	11/20/90	ABE et al.			

FOREIGN PATENT DOCUMENTS

		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES	NO

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

EXAMINER	DATE CONSIDERED

*EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.